X90IF7x0.04-00

1 General information

The modular X90 mobile control and I/O system opens up a wide range of possibilities in mobile automation. With the X90 mobile system, flexible automation concepts can be implemented based on a standardized complete system.

In addition to the existing interfaces on the mainboard, option boards for communication are available for connecting remote actuators and sensors.

- 3 CAN bus interfaces
- Serial interface

2 Order data

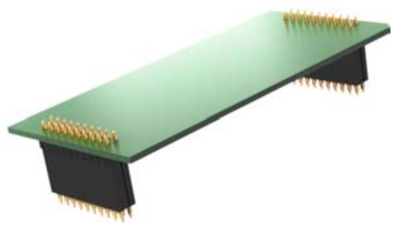
Model number	Short description	Figure
	Communication modules	
X90IF720.04-00	X90 mobile IF option board, 3x CAN, 1x RS232 configuration using software	
X90IF730.04-00	X90 mobile IF option board, 3x CAN, 1x RS485, configuration using software	

Table 1: X90IF720.04-00, X90IF730.04-00 - Order data

3 Technical data

Model number	X90IF720.04-00	X90IF730.04-00
Short description		
Communication module	3x CAN bus, 1x RS232	3x CAN bus, 1x RS485
General information		
B&R ID code	0xEF7F	0xEF80
Status indicators	-	
Power consumption	1.6 W	1.71 W
Certifications		
UN ECE-R10	Yes	
CE	Yes	
Interfaces		
Interface IF1		
Signal	CAN bus	
Max. distance	1000 m	
Transfer rate	Max. 1 Mbit/s	
Terminating resistor	External 120 Ω should be provided	
Interface IF2		
Signal	CAN bus	
Max. distance	1000 m	
Transfer rate	Max. 1 Mbit/s	
Terminating resistor	External 120 Ω should be provided	
Interface IF3		
Signal	CAN bus	
Max. distance	1000 m	
Transfer rate	Max. 1 Mbit/s	
Terminating resistor	External 120 Ω should be provided	
Interface IF4		
Signal	RS232	RS485
Max. distance	900 m	1200 m
Transfer rate	Max. 115.2 kbit/s	
FIFO buffer	1 kB	
Terminating resistor	No	Switchable in software
Electrical properties		
Electrical isolation	No	
Operating conditions		
Mounting orientation		
Any	Yes	
Degree of protection per EN 60529	Up to IP69K [1]	
Ambient conditions		
Temperature		
Operation		
Horizontal mounting orientation	-40 to 85°C housing surface [1]	
Vertical mounting orientation	-40 to 85°C housing surface [1]	
Storage	-40 to 85°C	
Transport	-40 to 85°C	
Relative humidity		
Operation	5 to 100%, condensing	
Storage	5 to 100%, condensing	
Transport	5 to 100%, condensing	
Mechanical properties		
Dimensions		
Width	47 mm	
Length	95 mm	

Table 2: X90IF720.04-00, X90IF730.04-00 - Technical data

1) Depends on the mainboard. For additional details, see the data sheet for the mainboard.

4 Operating and connection elements

4.1 X2X Link interface

Communication between the option board and mainboard is implemented using X2X Link.

4.2 Attachment cables

The connection is made via the connector on the mainboard.

Sensor cables are recommended for this.

5 Pinout

Channel	Pinout	
	X90IF720.04-00	X90IF730.04-00
1	CAN2_L	CAN2_L
2	CAN1_H	CAN1_H
3	CAN2_H	CAN2_H
4	CAN1_L	CAN1_L
5	RS232 RXD	RS485 DATA\
6	CAN3_H	CAN3_H
7	RS232 TXD	RS485 DATA
8	CAN3_L	CAN3_L
9	n.c.	n.c.
10	n.c.	n.c.

n.c. ... Not connected

6 Register description

6.1 System requirements

The following minimum versions are recommended to generally be able to use all functions:

- Automation Studio 4.3
- Automation Runtime 4.34

6.2 Overview of registers

6.2.1 CyclicStream

Function model "CyclicStream" uses a module-specific driver of the CPU's operating system. The CAN interfaces can be controlled using libraries "ArCAN" and "CAN_Lib"; the serial interface can be controlled using library "DvFrame" and reconfigured during runtime.
Cyclic I/O registers are used to ensure that communication follows deterministic timing.

Register	Name	Data type	Read		Write	
			Cyclic	Acyclic	Cyclic	Acyclic
Configuration - CyclicStream01 (CAN1)						
0x10F1	Output01MTU	USINT		•		•
0x10F3	Input01MTU	USINT		•		•
Configuration - CyclicStream02 (CAN2)						
0x11F1	Output02MTU	USINT		•		•
0x11F3	Input02MTU	USINT		•		•
Configuration - CyclicStream03 (CAN3)						
0x12F1	Output03MTU	USINT		•		•
0x12F3	Input03MTU	USINT		•		•
Configuration - CyclicStream04 (RS232 / RS485)						
0x13F1	Output04MTU	USINT		•		•
0x13F3	Input04MTU	USINT		•		•
Configuration - RS485						
0x1381	TerminationResistor	USINT		•		•

6.2.2 StreamFilter

Up to 4 stream filters can be configured per CAN interface. These determine which CAN IDs are forwarded to the CPU via the cyclic stream.
The filters are run through in numerical order. The first filter matching the incoming CAN message is used; all other filters are ignored. If no filter matches the incoming CAN message, a global configuration determines whether the message is rejected or accepted (default: accept message).
Each filter has a configurable ID and configurable filter mask. Only those bits of the ID are compared that are set to 0 in the mask.

Register	Name	Data type	Read		Write	
			Cyclic	Acyclic	Cyclic	Acyclic
Configuration - IF1StreamFilter (CAN1)						
0x1041	CfO_IF1DefaultCANFilterMode	USINT		•		•
0x104C + N*10	CfO_IF1CANFilter0N (index N = 1 to 4)	UDINT		•		•
0x1054 + N*10	CfO_IF1CANFilterMask0N (index N = 1 to 4)	UDINT		•		•
Configuration - IF2StreamFilter (CAN2)						
0x1141	CfO_IF2DefaultCANFilterMode	USINT		•		•
0x114C + N*10	CfO_IF2CANFilter0N (index N = 1 to 4)	UDINT		•		•
0x1154 + N*10	CfO_IF2CANFilterMask0N (index N = 1 to 4)	UDINT		•		•
Configuration - IF3StreamFilter (CAN3)						
0x1241	CfO_IF3DefaultCANFilterMode	USINT		•		•
0x124C + N*10	CfO_IF3CANFilter0N (index N = 1 to 4)	UDINT		•		•
0x1254 + N*10	CfO_IF3CANFilterMask0N (index N = 1 to 4)	UDINT		•		•

6.2.3 Status message

Register	Name		Data type	Read		Write	
	X90IF720.04-00	X90IF730.04-00		Cyclic	Acyclic	Cyclic	Acyclic
Configuration - Status messages							
6273	CfO_ErrorByte01		USINT				•
6275	CfO_ErrorByte02		USINT				•
Communication - Status messages							
6145	ErrorByte01		USINT	•			
	CANIF1warning		Bit 0				
	CANIF1passive		Bit 1				
	CANIF1busoff		Bit 2				
	CANIF1RXoverrun		Bit 3				
	CANIF2warning		Bit 4				
	CANIF2passive		Bit 5				
	CANIF2busoff		Bit 6				
	CANIF2RXoverrun		Bit 7				
6147	ErrorByte02		USINT	•			
	CANIF3warning		Bit 0				
	CANIF3passive		Bit 1				
	CANIF3busoff		Bit 2				
	CANIF3RXoverrun		Bit 3				
	RS232IF4StartBitError	RS485IF4StartBitError	Bit 4				
	RS232IF4StopBitError	RS485IF4StopBitError	Bit 5				
	RS232IF4ParityError	RS485IF4ParityError	Bit 6				
	RS232IF4RXoverrun	RS485IF4RXoverrun	Bit 7				
6209	ErrorQuitByte01		USINT			•	
	QuitCANIF1warning		Bit 0				
	QuitCANIF1passive		Bit 1				
	QuitCANIF1busoff		Bit 2				
	QuitCANIF1RXoverrun		Bit 3				
	QuitCANIF2warning		Bit 4				
	QuitCANIF2passive		Bit 5				
	QuitCANIF2busoff		Bit 6				
	QuitCANIF2RXoverrun		Bit 7				
6211	ErrorQuitByte02		USINT			•	
	QuitCANIF3warning		Bit 0				
	QuitCANIF3passive		Bit 1				
	QuitCANIF3busoff		Bit 2				
	QuitCANIF3RXoverrun		Bit 3				
	QuitRS232IF4StartBitError	QuitRS485IF4StartBitError	Bit 4				
	QuitRS232IF4StopBitError	QuitRS485IF4StopBitError	Bit 5				
	QuitRS232IF4ParityError	QuitRS485IF4ParityError	Bit 6				
	QuitRS232IF4RXoverrun	QuitRS485IF4RXoverrun	Bit 7				

6.3 Configuration register "CyclicStream"

6.3.1 Output0xMTU

Name:
Output01MTU to Output04MTU

These registers define the number of active Tx bytes and thus also the maximum size of a stream sequence.

Data type	Values
USINT	0 to 60

6.3.2 Input0xMTU

Name:
Input01MTU to Input04MTU

These registers define the number of active Rx bytes and thus also the maximum size of a stream sequence.

Data type	Values
USINT	0 to 60

6.3.3 TerminationResistor

Name:
TerminationResistor

This register is only available for X90IF730.04-00.
The terminating resistor of the interface can be enabled or disabled in this register.

Data type	Values	Information
USINT	0	Resistor disabled
	1	Resistor enabled

6.3.4 CfO_IFxDefaultCANFilterMode

Name:
CfO_IF1DefaultCANFilterMode to CfO_IF3DefaultCANFilterMode

These registers specify the default settings for IDs that do not match any of the set filters.

Data type	Values	Information
USINT	0	No filter response, the PDO frame is discarded.
	1	No filter response, the PDO frame is transferred via the stream.

6.3.5 CfO_IFxCANFilter

Name:
CfO_IF1CANFilter01 to CfO_IF1CANFilter04
CfO_IF2CANFilter01 to CfO_IF2CANFilter04
CfO_IF3CANFilter01 to CfO_IF3CANFilter04

The filter properties are defined in these registers.

Data type	Values
UDINT	See the bit structure.

Bit structure:

Bit	Description	Value	Information
0 to 28	FilterID	-	If ID29 = 0, 0 to 2047 (0x7FF) If ID29 = 1, 0 to 536 870 911 (0x1FFFFFFF)
29	ID29	0	11-bit ID
		1	29-bit ID
30	Reserved	-	
31	Enable	0	Filter inactive
		1	Filter active

6.3.6 CfO_IFxCANFilterMask

Name:
CfO_IF1CANFilterMask01 to CfO_IF1CANFilterMask04
CfO_IF2CANFilterMask01 to CfO_IF2CANFilterMask04
CfO_IF3CANFilterMask01 to CfO_IF3CANFilterMask04

The filter mask and filter mode are defined in these registers.

Data type	Values
UDINT	See the bit structure.

Bit structure:

Bit	Description	Value	Information
0 to 28	FilterMask	-	If ID29 = 0, 0 to 2047 (0x7FF) If ID29 = 1, 0 to 536 870 911 (0x1FFFFFFF)
29 to 30	Reserved	-	
31	Mode	0	Acceptance filter
		1	Discard filter

6.4 Cyclic data points for error indicators

6.4.1 ErrorByte

Name:
ErrorByte01
ErrorByte02

The individual error bits are transferred in this register. If an error occurs, the corresponding bit is set and held until acknowledgment is carried out.

Data type	Values
USINT	See the bit structure.

Bit structure of ErrorByte01:

Bit	Description	Value	Information
0	CANIF1warning	0	No error
		1	Error
1	CANIF1passive	0	No error
		1	Error
2	CANIF1busoff	0	No error
		1	Error
3	CANIF1RXoverrun	0	No error
		1	Error
4	CANIF2warning	0	No error
		1	Error
5	CANIF2passive	0	No error
		1	Error
6	CANIF2busoff	0	No error
		1	Error
7	CANIF2RXoverrun[1)]	0	No error
		1	Error

1) Incoming data is stored in a receive buffer and transmitted via the cyclic stream. If the amount of incoming data is greater than the amount transmitted, an overflow may occur. If the buffer is full, further incoming data is discarded.

Bit structure of ErrorByte02:

Bit	Description		Value	Information
	X90IF720.04-00	X90IF730.04-00		
0	CANIF3warning		0	No error
			1	Error
1	CANIF3passive		0	No error
			1	Error
2	CANIF3busoff		0	No error
			1	Error
3	CANIF3RXoverrun		0	No error
			1	Error
4	RS232IF4StartBitError	RS485IF4StartBitError	0	No error
			1	Error
5	RS232IF4StopBitError	RS485IF4StopBitError	0	No error
			1	Error
6	RS232IF4ParityError	RS485IF4ParityError	0	No error
			1	Error
7	RS232IF4RXoverrun[1)]	RS485IF4RXoverrun[1)]	0	No error
			1	Error

1) Incoming data is stored in a receive buffer and transmitted via the cyclic stream. If the amount of incoming data is greater than the amount transmitted, an overflow may occur. If the buffer is full, further incoming data is discarded.

6.4.2 ErrorQuitByte

Name:
ErrorQuitByte01
ErrorQuitByte02

The individual error bits are transferred in this register to acknowledge an error that occurs.
The acknowledgment bit can only be reset if the corresponding error status bit is no longer set.

Data type	Values
USINT	See the bit structure.

Bit structure of ErrorQuitByte01:

Bit	Description	Value	Information
0	QuitCANIF1warning	0	No acknowledgment
		1	Acknowledgment of the error
1	QuitCANIF1passive	0	No acknowledgment
		1	Acknowledgment of the error
2	QuitCANIF1busoff	0	No acknowledgment
		1	Acknowledgment of the error
3	QuitCANIF1RXoverrun	0	No acknowledgment
		1	Acknowledgment of the error
4	QuitCANIF2warning	0	No acknowledgment
		1	Acknowledgment of the error
5	QuitCANIF2passive	0	No acknowledgment
		1	Acknowledgment of the error
6	QuitCANIF2busoff	0	No acknowledgment
		1	Acknowledgment of the error
7	QuitCANIF2RXoverrun	0	No acknowledgment
		1	Acknowledgment of the error

Bit structure of ErrorQuitByte02:

Bit	Description		Value	Information
	X90IF720.04-00	X90IF730.04-00		
0	QuitCANIF3warning		0	No acknowledgment
			1	Acknowledgment of the error
1	QuitCANIF3passive		0	No acknowledgment
			1	Acknowledgment of the error
2	QuitCANIF3busoff		0	No acknowledgment
			1	Acknowledgment of the error
3	QuitCANIF3RXoverrun		0	No acknowledgment
			1	Acknowledgment of the error
4	QuitRS232IF4StartBitError	QuitRS485IF4StartBitError	0	No acknowledgment
			1	Acknowledgment of the error
5	QuitRS232IF4StopBitError	QuitRS485IF4StopBitError	0	No acknowledgment
			1	Acknowledgment of the error
6	QuitRS232IF4ParityError	QuitRS485IF4ParityError	0	No acknowledgment
			1	Acknowledgment of the error
7	QuitRS232IF4RXoverrun	QuitRS485F4RXoverrun	0	No acknowledgment
			1	Acknowledgment of the error

6.5 Configuration register for error indicators

6.5.1 CfO_ErrorByte

Name:
CfO_ErrorByte01
CfO_ErrorByte02

The error messages to be transferred must first be configured with this register. If the corresponding enable bit is not set, no error will be sent to the higher-level system if the error occurs.

Data type	Values
USINT	See the bit structure.

Bit structure of CfO_ErrorByte01:

Bit	Description	Value	Information
0	CANIF1warning	0	Ignore error
		1	Indicate error
1	CANIF1passive	0	Ignore error
		1	Indicate error
2	CANIF1busoff	0	Ignore error
		1	Indicate error
3	CANIF1RXoverrun	0	Ignore error
		1	Indicate error
4	CANIF2warning	0	Ignore error
		1	Indicate error
5	CANIF2passive	0	Ignore error
		1	Indicate error
6	CANIF2busoff	0	Ignore error
		1	Indicate error
7	CANIF2RXoverrun	0	Ignore error
		1	Indicate error

Bit structure of CfO_ErrorByte02:

Bit	Description		Value	Information
	X90IF720.04-00	X90IF730.04-00		
0	CANIF3warning		0	Ignore error
			1	Indicate error
1	CANIF3passive		0	Ignore error
			1	Indicate error
2	CANIF3busoff		0	Ignore error
			1	Indicate error
3	CANIF3RXoverrun		0	Ignore error
			1	Indicate error
4	RS232IF4StartBitError	RS485IF4StartBitError	0	Ignore error
			1	Indicate error
5	RS232IF4StopBitError	RS485IF4StopBitError	0	Ignore error
			1	Indicate error
6	RS232IF4ParityError	RS485IF4ParityError	0	Ignore error
			1	Indicate error
7	RS232IF4RXoverrun	RS485IF4RXoverrun	0	Ignore error
			1	Indicate error

6.6 Cyclic stream communication

The physical properties of the bus system limit the amount of data that can be transmitted during one bus cycle.

MTU (Maximum Transmission Unit) - Physical transport:

The MTU describes the enabled USINT registers that are available to the cyclic stream for data transfer. A separate MTU is defined for each direction of communication.
OutputMTU defines the number of Tx bytes; InputMTU defines the number of Rx bytes.
The MTUs are transported cyclically via the X2X Link network, increasing the load with each additional enabled USINT register.

Relationship between MTU size and X2X cycle time

Depending on how large the MTU of the individual interfaces is set, certain minimum times must be observed on the X2X Link network; otherwise, it can happen that the module has too little time for X2X handling and a reset is triggered.

The decisive factor here is the sum of all MTU sizes in one direction (input/output) of all interfaces together. The larger the X2X cycle time is set, the larger the sum of the MTUs can be.